

# RHIC Physics Case for E907

## *Interpretation of CERN results and implications for RHIC*

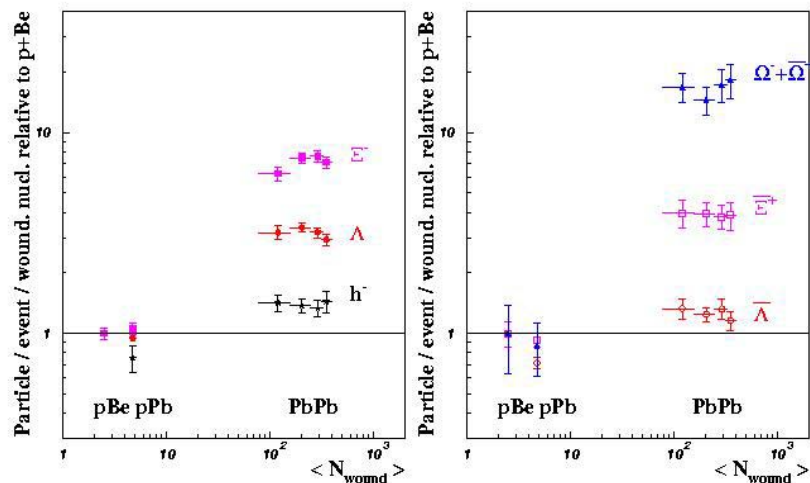
Comparisons of data from BNL E910, CERN WA97, NA49, and RHIC

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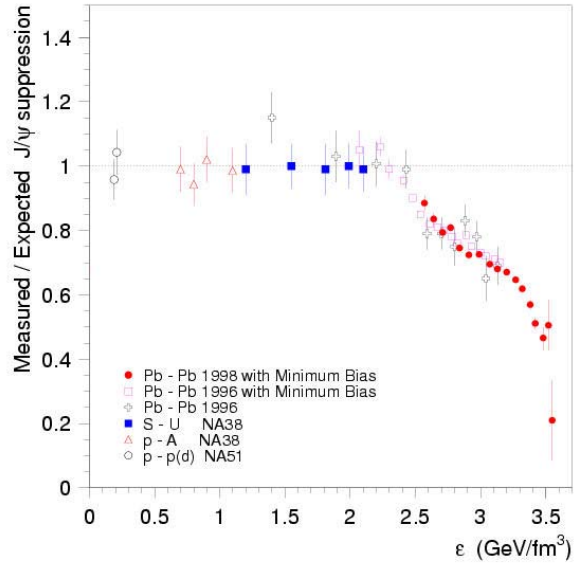
Changed by: Ron A. Soltz, 27-Sep-2001

## CERN Evidence for New State of Matter

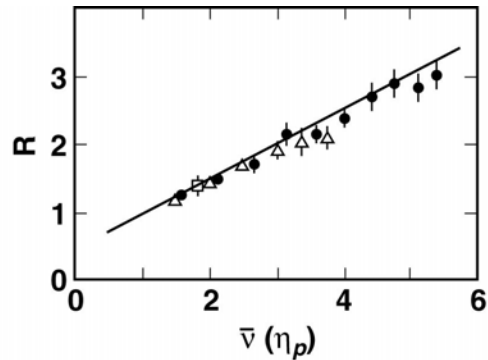
- The CERN claim is based on two key pieces of evidence
  - [CERN WA97](#)  
[Phys. Lett. B 449:401 \(1999\)](#) Strangeness enhancement at mid-rapidity in Pb-Pb collisions at 158 A GeV/c



- [CERN NA50](#)  
[Phys. Lett. B 477:28 \(2000\)](#) Evidence for deconfinement of quarks and gluons from the J/psi suppression pattern measured in Pb-Pb collisions



- Normalizations for both figures have their origins in pA data.
  1. Wounded Nucleon Motivation
    - FNAL [Phys. Rev. Lett 34:836 \(1975\)](#) and [Phys. Rev. D 22:13 \(1980\)](#)
    - CERN SPS NA5 [Phys. Rev. D 29:2476 \(1984\)](#)



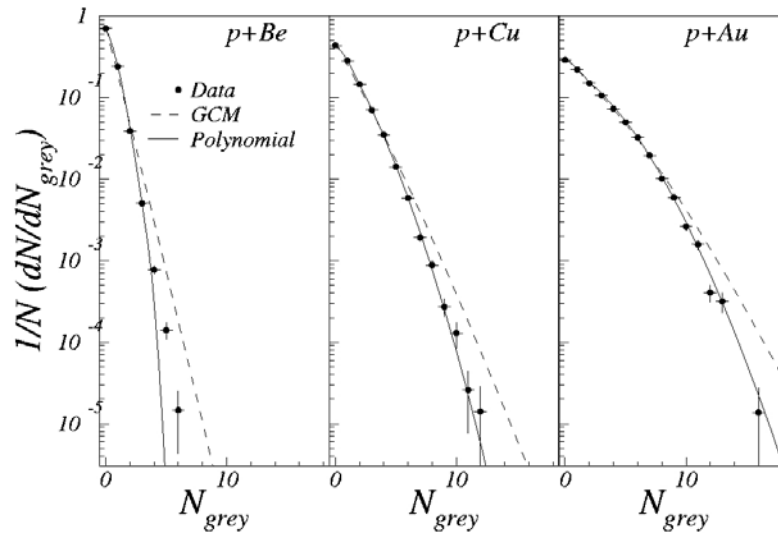
**Figure 4. The ratio  $R = \langle n \rangle_{pA} / \langle n \rangle_{pp}$  versus the average number  $\bar{\nu}(\eta_p)$  of projectile collisions for  $pXe$  (circles),  $pAr$  (triangle), and  $pNe$  (squares) collisions. A line of the form  $R = 0.5[\bar{\nu}(\eta_p) + 1]$  is shown for comparison.**

## 2. J/Psi absorption in pA

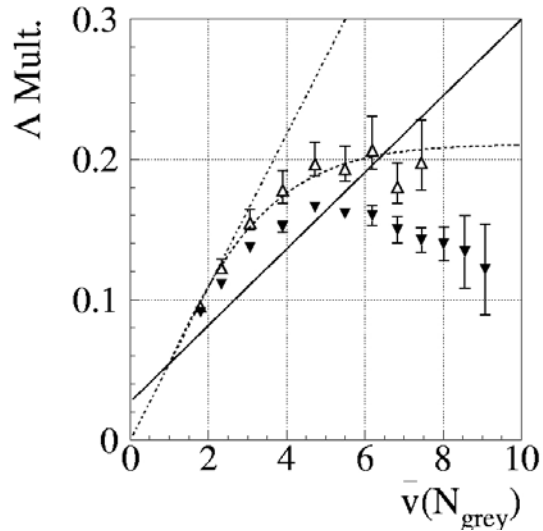
- For E907 Physics, we are concerned only with the Strangeness calibration

## Results from E910

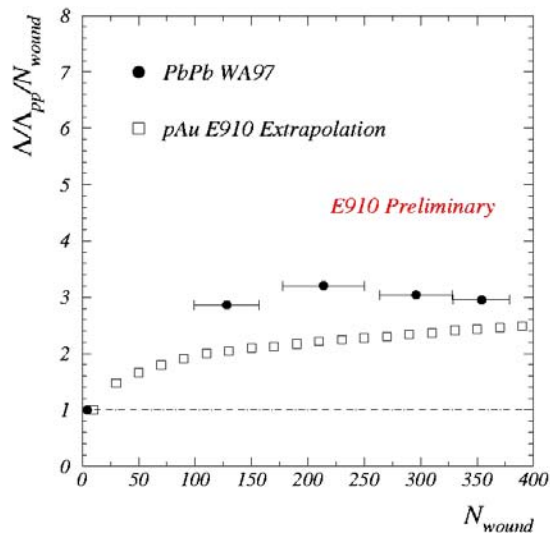
- E910 pA Centrality Measurement
  - [Phys. Rev. C 60:024902 \(1999\)](#) Measuring centrality with slow protons in proton-nucleus collisions at 18 GeV/c
  - Use grey tracks, 0.25-1.2 GeV/c protons, to gauge number of primary collisions
  - Provides better than 10% centrality cut



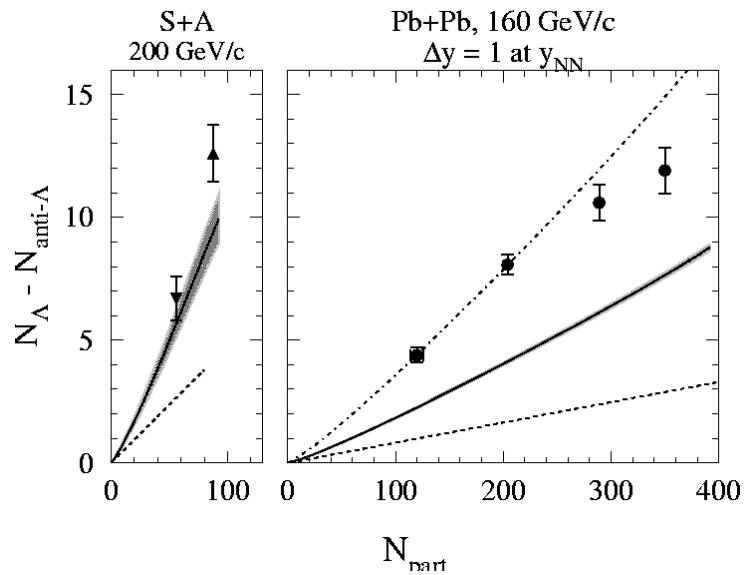
- E910 Lambda and Kshort vs. Centrality
  - [Phys. Rev. Lett., 85:4868 \(2000\)](#)
  - Use grey tracks, 0.25-1.2 GeV/c protons, to gauge number of primary collisions
  - Provides an effective 1% centrality cut on strange particle production



- The solid line wounded nucleon model prediction fails to reproduce the data
- Extrapolation of E910 results to WA97 acceptance
  - Extrapolation based on two assumptions
    1.  $N(s, \nu) = N_{pp}(s) \times f(\nu)$  :  $f(\nu)$  is energy independent
    2.  $f(\nu)$  follows Constituent Quark Model (CQM)
- From Xihong Yang, Columbia University Ph.D. Thesis



- From upcoming E910 publication (B.Cole)



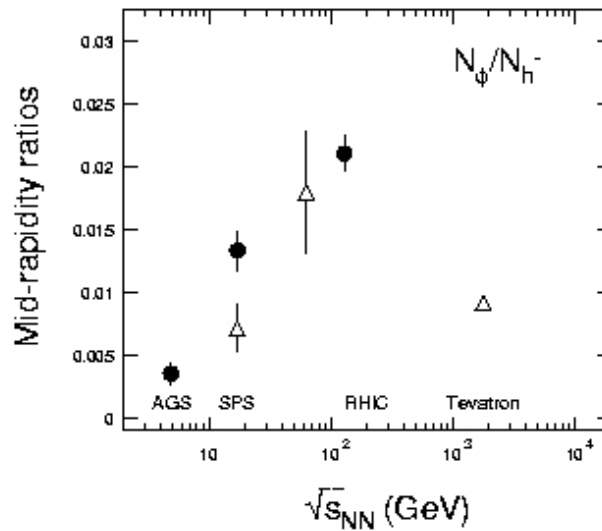
- NA49 now has a similar result for Cascade

## Goals for E907

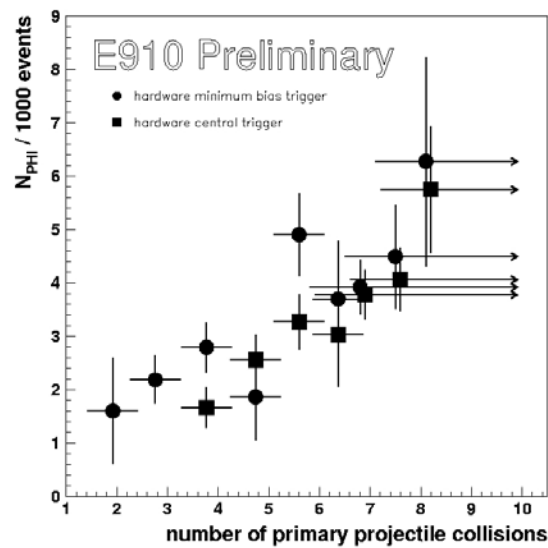
- Reproduce centrality measure of E910
- Test Assumption 1.) Is  $f(\nu)$  for Lambdas the same at higher energy?
- Test Assumption 2.) Does CQM apply to multi-strange baryon production?

## Early Results from RHIC

- Lambda, Cascade, Omega yields not yet available
- STAR Phi results
  - [Submitted to Phys. Rev. Lett](#)
  - Phi to negative hadrons



- The CERN ratio (prefer yields) is intermediate between RHIC and AGS
- Needs pA data comparison
- E910 Preliminary Phi results



## How E907 fits into Heavy-ion Physics

- Comparisons to pp are insufficient
- pA collisions have multiple collision process and nuclear medium without high energy densities over extended regions

- E907 needed to understand one important aspect of the CERN results
- E907 essential component of the larger study of pA collisions from AGS to RHIC